

## Qs/As

### EPA Analysis of Cape Fear River samples for GenX and other PFAS analytes

#### Q.) What other types of PFAS is EPA measuring in the Cape Fear River water samples?

A.) In addition to GenX, EPA scientists are analyzing the Cape Fear River samples to determine the presence of perfluoro-2-methoxyacetic acid, perfluoro-3,5-dioxahexanoic acid, and perfluoro-3,5,7-trioxaoctanoic acid, which are related perfluoroalkyl substances (PFAS). EPA scientists are also analyzing the Cape Fear River samples to determine the presence and concentration of two chemical byproducts from the production of Nafion, a synthetic polymer used in fuel cell production. Manufactured chemical standards, which are essential for confirming chemical identity and calculating chemical concentrations in water samples, are not available for any of these substances. Therefore, EPA scientists are identifying these PFAS based on careful measurements of their molecular weights and fragmentation patterns, while estimating their concentrations using closely-related compounds for calibration.

#### Q.) What are authentic chemical standards?

A) Authentic chemical standards are chemicals that can be purchased from a commercial supplier, and can be used in laboratory analysis to confirm the identity of a chemical.

#### Q.) What lab equipment as used to analyze the Cape Fear River Samples?

A.) A Triple Quad Mass Spectrometer (MS/MS) was used to analyze the Cape Fear River samples for weeks 1-4. A Time of Flight Mass Spectrometer was used to analyze weeks 5-6. Additionally, the Time of Flight Mass Spectrometer was used to analyze samples from the Chemours Company Outfall near Fayetteville, N.C., and the Sweeney Water Treatment Plant in Wilmington for weeks 1-6.

#### Q.) What lab methods are being used in EPA's analysis of the Cape Fear River samples?

A) The lab method being used in the GenX analyses was developed by EPA/ORD scientists and has been used in EPA research and in analysis efforts requested by states. The lab method is detailed in the peer-reviewed Sun, et.al., journal article published in 2016 in *Environmental Science & Technology Letters*:

- Sun M, Arevalo E, Strynar M, Lindstrom A, Richardson M, Kearns B, Pickett A, Smith C, Knappe D. "Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina." *Environ Sci Technol Letters*. 2016, 3(12), pp 415-419. [ HYPERLINK "<http://pubs.acs.org/doi/abs/10.1021/acs.estlett.6b00398>" ]

**Non-Targeted methods:** EPA researchers are also using new “non-targeted” screening methods to develop concentration estimates of five related perfluoroalkyl substances (PFAS) that have been identified in the Cape Fear River samples. With non-targeted screening, researchers are able to take a water sample and identify unknown chemicals that may be present, rather than simply seeing if a particular chemical is present or not. Usually, when researchers test to see what is in the water, they identify what they are looking for and then they test for it. This is called targeted screening.

**Q.) What do “semi-quantitative” results mean and how are these results derived?**

**A)** The identity of the five related perfluoroalkyl substances (PFAS) that EPA scientists are analyzing in the Cape Fear River samples, have been established using non-targeted screening methods and sophisticated laboratory mass spectral analysis. However, because manufactured chemical standards for these chemicals are not available, their concentration can only be estimated based on the analysis of similar chemicals for which standards are available. Accordingly, their concentration estimates are “semi-quantitative,” and more uncertain than with traditional analysis.

**Q) What are “non-targeted” screening methods?**

**A)** EPA researchers are using new “non-targeted” screening methods to develop concentration estimates of five related perfluoroalkyl substances (PFAS) that have been identified in the Cape Fear River samples. With non-targeted screening, researchers are able to take a water sample and identify unknown chemicals that may be present, rather than simply seeing if a particular chemical is present or not. This is different from the more commonly known targeted screening, which is when researchers identify what they are looking for in the water and then test for those specific things.

**Q) What concentrations of GenX were found in the Cape Fear River samples?**

- A)** GenX concentrations levels in the Cape Fear River have gone down as the weeks of sampling progressed:
- In weeks 1-3 of sampling, the GenX concentration range varied from 4 to 21,760 ng/L.
  - In weeks 4-5 of sampling, GenX concentrations ranged from below our limit of quantitation (5 samples) to 2,430 ng/L.
  - In weeks 6-7, GenX concentrations ranged from below our limit of quantitation (5 samples) to 102 ng/L.

**Q) What concentration levels of the PFECAs (PFMOAA, PFO2HxA and PFO3OA) were found in the Cape Fear River water samples?**

**A)** EPA scientists used non-targeted screening methods to analyze samples gathered by NCDEQ from the Chemours Outfall in Fayetteville, and from the finished drinking water at the Sweeney Water Treatment Plant in Wilmington. The ranges varied widely and are listed below.

- PFMOAA:
  - Chemours Outfall range: 696 ng/L to 134,000 ng/L
  - Sweeney Water Treatment Plant range: 21 ng/L – 11,300 ng/L
- PFO2HxA
  - Chemours Outfall range: 431 ng/L – 383,000 ng/L
  - Sweeney Water Treatment Plant range: 1,100 ng/L – 8,880 ng/L
- PFO3OA
  - Chemours Outfall range: 86 ng/L to 109,000 ng/L
  - Sweeney Water Treatment Plant range: 641 ng/L to 3,130 ng/L

**Q) What concentration levels of Nafion byproducts were found in the Cape Fear River water samples?**

**A)** EPA scientists used non-targeted screening methods to analyze samples gathered by NCDEQ from the Chemours Outfall in Fayetteville, and from the treated water at Sweeney Water Treatment Plant in Wilmington. The ranges of concentrations for the Nafion Byproducts varied widely and are listed below.

- Nafion Byproduct 1
  - Chemours Outfall range: 2,900 ng/L to 15,800 ng/L
  - Sweeney Water Treatment Plant range: 53 ng/L to 158 ng/L
- Nafion Byproduct 2
  - Chemours Outfall range: 24,200 ng/L to 73,900 ng/L
  - Sweeney Water Treatment Plant range: 1,640 ng/L to 7,860 ng/L

**Q) What are Nafion byproducts?**

**A)** Nafion, a chemical compound used in fuel cell production, is a co-polymer made up of two different sub-units: tetrafluoroethylene (used in Teflon) and a polyfluorinated ether sulfonate sub-unit. The Nafion byproducts identified in the Cape Fear River samples are thought to be formed in the manufacture of Nafion.

**Q) Why are the concentration levels of the PFECAs (PFMOAA, PFO2HxA and PFO3OA), in some cases, higher at the Sweeney Water Treatment Plant than at the Chemours Outfall?**

**A)** The estimation of the time it takes for water to flow from the Chemours outfall to the Sweeney Water Treatment Plant intake is not precise and the discharge is not consistent. Thus we may see increases and/or decreases in the outfall that are not directly reflected in the treated drinking water from the Sweeney plant. Prior weeks' discharges were perhaps not yet

washed out of the Cape Fear River by the time the next week's samples were taken at the Sweeney plant.

**Q) When was the finding of GenX in treated drinking water first reported in EPA's scientific literature?**

**A)** The finding of GenX in treated drinking water was first reported in a 2016 peer-reviewed journal article by EPA/ORD scientists titled "[ HYPERLINK ["http://pubs.acs.org/doi/abs/10.1021/acs.estlett.6b00398"](http://pubs.acs.org/doi/abs/10.1021/acs.estlett.6b00398) ]" published in *Environmental Science & Technology Letters* in 2016.

**Q) What does it mean to "saturate" a mass spectrometer?**

**A)** When the mass spectrometer is given more chemical signal than the detector can handle it is said to be "saturated." For example, if a thermometer only goes up to 100°C, and is placed in a solution that is 250°C, the thermometer will rise until it can go no higher (100°C) and will not be able to "read" a value above this upper limit. In this situation, the thermometers' response is said to be saturated.

**Q) Where did EPA scientists get information on Chemours' chemical products?**

**A)** Information about Chemours chemical products is available via the following EPA website: [https://iaspub.epa.gov/enviro/tsca.get\\_chem\\_info?v\\_registry\\_id=110000559609](https://iaspub.epa.gov/enviro/tsca.get_chem_info?v_registry_id=110000559609)

**Q) What is monoisotopic mass?**

**A)** For typical organic compounds, "monoisotopic mass" is a summation of the masses of the lightest naturally-occurring stable isotope of the elements that make up that chemical formula.

**Q) What is an "integrated peak area?"**

**A)** An integrated peak area is a computer generated readout for the response of the mass spectrometer for a given analyte. The area integrated is from when a peak rises from background, to when the peak returns to background, and generally spans a short period of time. A larger peak has more area as it is higher and usually wider than a smaller peak. The area of an integrated peak is directly proportional to the concentration of a chemical.

**Q) Where can I find more information about PFAS?**

**A)** For more information about PFAS, see: [ HYPERLINK "<https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/and-polyfluoroalkyl-substances-pfas-under-tsca>" ]